An unusually heavy fog occurred here, at Northfield, Mass., on the night of October 25–26th. Our fog was one of the heaviest I ever knew. At present (October 26) the appearance of the higher stratum of atmosphere is one of dryness; therefore, the humid stratum is on the ground, therefore, as natural, rain must be produced above the ground, it remains for man to produce artificial rain from the fog. About 3 o'clock this morning I was awakened by the noise of drops falling from various leafless trees. There are three rain spouts conducting rain water from the north and west sides of slated roofs into a cistern and each spout was running a stream. After the sun had risen, although the fog had not gone from the surface of the ground, yet the precipitation stopped evidently because the tendency of the air was to rise upward. Therefore, fog rain must be produced on the windward side of the catch or stream. As the fog movement is either up or down and not horizontal, therefore the catching screens should be so placed as to intercept the vertical ascending or descending currents. The ground itself and its attachments, such as vegetation, buildings, etc., intercept, perhaps, one-half of what might be caught, viz, they catch only those particles of fog that are descending. Allowing that Mr. Betts' system of wire screens catches only what a similarly exposed surface in nature catches, it would appear necessary to construct, instead of one, a series of networks from which pipes could be led to the cultivated area, cisterns, etc. As this series would have to extend many feet upward into the air the first cost would be considerable, but when properly painted it should last many years. I may be pardoned for suggesting that by the introduction of electrical currents, some test might be made as to the influence of that agent in attracting and collecting cloud particles into raindrops.

In communicating the above letter, under date of November 11, Mr. Betts adds:

This letter seems to be plain proof that vertical wires will not easily catch the ascending and descending moisture in a fog or dew; the wire must be horizontal. * * * Iowa is an excellent country to experiment in, and March, April, May, September, October, November, are the best months.

The relative efficiency of horizontal and vertical wires must depend principally upon the force of the wind. In the case of the summit of Green Mountain, on the Island of Ascension, there is a steady strong wind, and the cloud particles are caught quite as well by horizontal as by vertical wires, provided they are transverse to the direction of the wind. In the still air of a foggy night in Iowa the wires would doubtless do best when they are horizontal, giving them, however, a slight inclination in order to facilitate the drainage toward a definite spot. In the fogs of the California coast the wires might have any inclination in a vertical plane transverse to the wind. It would be very desirable to investigate the total amount deposited upon a tin or slate roof and the percentage that can be made to run down the rain spouts and become useful for irrigation purposes. In most cases inclined surfaces or troughs of sheet iron or tin would probably be best. Various other suggestions are given in the REVIEWS for 1898, p. 466; 1899, pp. 100, 112, 195.

AURORAS IN TEXAS.

In the Commoner, published at Albion, Tex., September 30, 1899, Mr. D. Lee Slataper, civil engineer, publishes an account of a "rainbow" that occurred about 2:35 a. m., Sunday morning, September 17, at Alvin. It was also seen by others. Mr. Slataper says:

About 1 a. m. a storm was seen approaching from the east, very similar to the "northers" approach, with a complete line extending across the entire heavens. The storm of rain and lightning soon passed over, and the moon was seen about 30° high, in the southwest, while a heavy rain was also falling in the east. Mr. Slataper and several others now observed a complete rainbow, from horizon to horizon, with the center of the bow 45° high. The bow was of blue-gray, with silvery lining, mingled toward the ends with an almost solid purple. Its background consisted of clouds of the blackest tint possible. The colors in the bow seemed to twinkle and then fade for an instant and then reappear as bright as ever.

He desires an explanation of the causes of the change of color, from orange and red to silvery tints with blue and purple linings.

This bow of light is not likely to have been a rainbow due to the feeble light of the moon. It occurred, not only in connection with a local thunderstorm, but also in connection with an extensive aurora borealis, and it is possible that the observer really saw one of the numerous long horizontal beams of light that generally attend the aurora. The beams are nearly straight, but the effect of perspective is to give each one the appearance of an arch. The colors of the aurora borealis have not yet been satisfactorily explained.

FROSTS AND STRAWBERRY CROP.

In the October number of the Minnesota Section Mr. T. S. Outram, Section Director, publishes a letter by Mr. G. J. Kellogg, of Lake Mills, Wis., which is valuable as giving the observations of an experienced man on the actual effects of frost in that locality. Mr. Kellogg says:

A long continued cold east wind is frequently worse in its effect than frost. It will be remembered that in 1897 severe frosts continued up to June 8, and the impression was general that there would be no fruit, but the crop of small fruits was never better. In the season of 1898 there was no frost after May 6, and there was a crop as good as in the previous season, but no better.

The condition of the atmosphere, as regards moisture, has much to do with the effects of frost. If everything is dry at the time of frost there will be little injury, and if a mist comes up before the sun's rays strike the foliage, the injury will be almost nothing, unless ice has formed. * * * * * * * *

Our most severe frosts occur when the nights are dry and still, though there is often a heavy deposit of dew on the ground the same night.

In the spring frosts never occur in cloudy weather, but the blighting east winds may do more damage at that season than the frosts.

With strawberries we find the effect of light frost is greater on the pollen anthers than on the pistils, and that often the pistillate strawberries may become pollenized before the frost occurs and give better returns than the bisexual varieties near them, hence the opinion that the pistillates are greater bearers. There is no doubt that a strawberry producing a great deal of pollen is more or less weakened by the process, but we now have such varieties as the Splendid, Lovett, Wood, Enhance, and Clyde that carry plenty of pollen and still are just as productive as any of the pistillates.

I have known frosts at 45°, but there was no injury till the temperature went below 40°.

There were sixteen days up to May 25 of this year with the temperature ranging below 42°, but there were no frosts to cause injury except on the low grounds, and the outlook for fruit was good, had not the vitality of trees and plants been reduced by the dry root freeze of the winter preceding.

WARM RAINS AND ANGLE WORMS.

It frequently happens that after a warm rain the sidewalks in the city and the fields in the country show a great number of angle worms, or so-called earth worms, crawling about on the surface, and popular ignorance speaks of a "rain of worms" as though they had come down from the clouds. Tornadoes have been known to carry up all the water of a pond and allow the fishes to drop at some distant place, but they generally are found dead. These angle worms are not at all a case of this kind. In the October number of the report of the Michigan Section, Mr. C. F. Schneider, Section Director, gives the views of Darwin, and also the theory of Dr. Kedzie, of the State Agricultural College, as to the reason for the appearance of the angle worms. Darwin says:

The worms can live for several days below water. When the ground is dry they penetrate to a considerable depth and cease to work. Their respiration takes place through the pores of the skin which requires a certain amount of moisture to keep it in an active condition. When the skin dries up the worm dies because its respiratory organs have been closed by contraction.

As to their appearance above ground after a heavy rain, Darwin says:

I believe that they were already sick and their deaths were merely hastened by the ground being flooded.

Mr. Schneider and Dr. Kedzie say:

The writer has often noticed, in this connection, that on a lawn which is sprinkled the earth worms are very near the surface, in fact, if the ground is nearly saturated with moisture near its surface, the worms are partially above ground. This brings us to the theory advanced by Dr. Kedzie, of the Michigan Agricultural College, who says that, although the earth worms can live under water for some time, it is distasteful and that the worm will not stay under water when it can get out. Dr. Kedzie advances the idea that the ground being well soaked with water and the air thus expelled the earth worms leave their burrows and come out to breathe, crawling upon sidewalks or other objects where they can get the pure fresh air.

We hope that the proper consideration of this subject will remove one more popular error from the domain of meteorology. The rains of frogs and of flesh and of blood belong to the same category. They may be phenomena of natural history but are not meteorological.

THIS YEAR'S CROP AND LAST YEAR'S GROWING SEASON.

It is natural to endeavor to trace the connection between the weather of any growing season and the resultant crop. Some years ago the Editor made a detailed study of the numerous conditions that effect the corn crop almost entirely outside of weather conditions. The conclusion was that the crop gathered from a field of corn depends so largely upon cultivation and skill in agriculture, it is so entirely an artificial product, that the influence of the weather as such is very largely obscured. It is only when a given yield per acre differs from the the normal by 25 per cent or more that we begin to get a clear insight into the influence of the weather.

The same principles apply to other crops, such as fruits, especially apples, pears, and peaches. In the October report of the Maryland and Delaware Section attention is called to the fact the orchardists of Missouri finding that the peach crop for 1899 would be a failure, soon began to cut back the trees and that this extensive pruning has brought about a splendid growth of new branches, with a prospect of a great crop in 1900. The plan of cutting back whenever early frosts have cut off a current crop is not particularly new. It has long since been applied to the vine, and in general is based upon the consideration that the best fruit comes from the youngest branches, and that if there is to be no fruit this year, then all the growing powers of the plant should be forced to bring forth fresh branches for next years crop. A tree or a vine is a storehouse whence the fruit draws its substance. If the crop fails in any given year a double amount of nutritious matter remains stored up in the body of the plant for use next year, so that if next year's season is favorable there will be an extra good crop, but if unfavorable, the storage process continues until the favorable season comes. It would be therefore quite misleading in many cases if we should attempt to define an exact relation between the weather and the crop of any particular growing season. We must study the past history of the plant for several seasons.

PROTECTION AGAINST FROST.

It has, we believe, been abundantly shown that in order to protect any extensive area of vegetation against injury by frost we must use a sufficient quantity of heat to keep the temperature above freezing for a few hours, or even days, while the danger is impending. It matters not whether the heat be used (1) to heat the air or the ground directly, or (2) to evaporate water and make a cloud of fog, or (3) to burn smudge and make a protecting cloud of smoke, or (4) whether the heat be utilized in the shape of work by engines spreading a layer of cloth or wooden slats over the field in order to shut in the heat of the soil and prevent its radiation to the clear sky, or (5) in the most interesting of all the physical processes—where water is used to moisten the soil and thereby passes from the condition of a compact mass of liquid into that of a thin capillary film surrounding every particle of soil over a large area, whereby a large quantity of latent heat is evolved; in all these, and doubtless other methods that might be mentioned, a certain adequate amount of heat must be utilized in order to counteract the tendency to freeze. The only question for the agriculturist is as to how he may accomplish his object most economically.

As regards the manner of making protective clouds of smoke or steam, or a mixture of both, several methods are given in Weather Bureau Bulletin No. 23, by Mr. W. H. Hammon, On Protection from Frost, but there are times when the simple direct heating of the air or the ground is also to be recommended as an economical process.

THE WEATHER AND THE DAIRY.

In a recent number of the report of the Virginia Section, Mr. E. A. Evans gave some results of his own observations on the effect of a fall in the temperature of the air, as causing a diminution in the yield of milk. He returns to this subject in the October report where he prints a further discussion from the Southern Planter. It appears that the practice of allowing cattle to stay in the fields or open pens all night during the winter months is productive of great loss to the farmers of the Southern States. * * * The food fed to the animals is first used in maintaining life and animal heat and only the surplus goes to the production of increased flesh or milk. The effect of a fall in temperature is to cut off this surplus. From records made at the Texas station during a norther, it was shown that the first effect of the cold was to increase the yield of butter, but the continued effect was to decrease both butter and milk by 20 per cent, and the cows did not recover for several days after the cold weather.

If cows are allowed to drink ice cold water, there is a fall of 6 or 8 per cent in the yield of milk as compared with those drinking warmer water.

LOSSES BY LIGHTNING.

The Iowa Monthly Review for October publishes an excellent article on losses by lightning in 1899, by Director J. Russell Sage, from which we quote the following as being of universal interest:

A notable feature of the crop season of 1899 was its unusual number of severe storms and excessive display of electric energy. This was an especial characteristic of the season from about the 1st of May to the middle of July, during which period more than three-fourths of the reported losses by lightning occurred. May was the stormiest month, the records showing that a measurable amount of rain fell at some station in the State during every day of the month. In June there was but one absolutely rainless day for the State at large, and nearly all the severe storms that occurred in these two months were accompanied by electric disturbances, resulting in more or less damage to farm property.

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The aggregate loss of property covered by these 395 reports is $52,524, of which sum $35,194 was the total loss estimated on buildings, and $17,330 on live stock.

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These reports give details of the loss of 581 farm animals from the